



PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.: 10/662,751
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Applicant: Goss et al
Group Art Unit: 3682
Examiner: Krause
Title: BEARING CUP ROTATIONAL LOCK ASSEMBLY
Attorney Docket: 6679-000036

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
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AMENDMENT

Sir:

Pursuant to the Notice of Non-Compliant Amendment mailed January 25, 2007, please amend the application as follows and consider the remarks set forth below.

1. (withdrawn) A bearing cup adapted to prevent rotation of a bearing race held therein relative to an external structure supporting the bearing while allowing axial movement of the bearing, the bearing cup comprising:

a circumferential ring adapted to support an outer race of a bearing;

at least one tang extending axially outward from a first edge of the ring; and

wherein the tang is adapted to engage a portion of the external structure to prevent the outer race of the bearing from rotating while allowing the bearing to move in an axial direction.

2. (withdrawn) The bearing cup of claim 1, further comprising a shoulder extending radially in a first direction from an inner surface of the circumferential ring;

3. (withdrawn) The bearing cup of claim 1, further comprising at least one slot and at least one tooth formed in the second edge adapted to couple with a second bearing cup having a matching slot and tooth such that the bearing cup prevents rotation of the second bearing cup.

4. (withdrawn) The bearing cup of claim 1, further comprising a chamfered edge formed on the first and/or second side.

5. (withdrawn) The bearing cup of claim 1, wherein at least a portion of the surfaces of the bearing cup are covered in a lubricant.

6. (withdrawn) The bearing cup of claim 1, wherein the at least one slot is sized such that the slot is larger than the at least one tooth.

7. (withdrawn) The bearing cup of claim 1, wherein the at least one slot is formed adjacent to the at least one tooth.

8. (previously presented) A bearing assembly for use in an apparatus comprising:

a first bearing having an inner race and an outer race;

a first bearing cup disposed around the first bearing and secured to the outer race thereof, the first bearing cup having at least one tang extending out from the first bearing cup, the tang adapted to interface with a portion of the apparatus to prevent the first bearing cup from rotating while allowing the bearing cup and thus the bearing to move in an axial direction; and

a second bearing having an inner and an outer race and a second bearing cup disposed around the second bearing and secured to the outer race thereof, the second bearing cup interlocking with the first bearing cup such that the first bearing cup allows only a predetermined limited amount of rotational movement of the second bearing cup, while allowing a predetermined degree of axial movement of the second bearing cup relative to the first bearing cup.

9. (cancelled)

10. (previously presented) The bearing assembly of claim 8, wherein the bearing cups include at least one tooth and at least one slot, the tooth of the first bearing cup disposed within the slot of the second bearing cup and the tooth of the second bearing cup disposed within the slot of the first bearing cup.

11. (original) The bearing assembly of claim 10, wherein the slots are larger than the teeth such that the teeth may partially rotate therein.

12. (previously presented) The bearing assembly of claim 11, wherein the bearing cups are generally ring shaped and each include a shoulder extending radially inward from an inner surface thereof, the shoulders abutting the outer races to align the bearing cups on the bearings.

13. (original) The bearing assembly of claim 12, further comprising a spring disposed between the bearings and the bearing cups to preload the bearings, the spring sandwiched between the shoulders of the bearing cups.

14. (original) The bearing assembly of claim 13, wherein the bearing cups each include a plurality of teeth disposed within a plurality of slots to form an interlocking mesh, and wherein the spring is protected between the shoulders and the interlocking teeth of the bearing cups.

15. (original) The bearing assembly of claim 11, further comprising a shim disposed between the inner races of the bearings to space the bearings apart from one another.

16. (previously presented) The bearing assembly of 8, wherein the first bearing cup is secured to the outer race of the first bearing by heating the first bearing

cup and chilling the first bearing such that an interference fit is formed between the first bearing cup and the outer race of the first bearing.

17. (withdrawn) An apparatus comprising:

a housing defining a pocket;

a rotating shaft at least partially disposed within the housing and capable of moving in an axial direction;

a first bearing having an inner and an outer race, the first bearing supporting the rotating shaft within the inner race;

a first bearing cup disposed around the first bearing and secured to the outer race thereof, the first bearing cup including at least one tang extending axially from a first side of the bearing cup, at least one tooth extending axially from a second side of the bearing cup opposite the first side, and an at least one slot formed in the second side, the tang having a length less than a depth of the pocket;

a second bearing having an inner and an outer race, the second bearing adapted to support the rotating shaft;

a second bearing cup disposed around the second bearing and secured to the outer race thereof, the second bearing cup including at least one slot formed therein;

wherein the tooth of the first bearing cup is disposed within the slot of the second bearing cup; and

wherein the tang extends into the pocket of the housing thereby preventing the first and second bearing cups from rotating while allowing the first and second bearing cups to move with the shaft in an axial direction.

18. (withdrawn) The apparatus of claim 17, wherein the second bearing cup includes at least one tooth extending axially therefrom, the tooth of the second bearing cup disposed within the slot of the first bearing cup.

19. (withdrawn) The apparatus of claim 17, further comprising a spring disposed between the first and second bearings for preloading the bearings.

20. (withdrawn) The apparatus of claim 19, wherein the first and second bearing cups each include a shoulder, the spring disposed between the shoulders of the first and second bearing cups.

21. (withdrawn) The apparatus of claim 17, wherein the bearings are angular contact ball bearings.

22. (withdrawn) The apparatus of claim 17, further comprising a damper seal at least partially disposed within the housing and at least partially defining the pocket of the housing.

23. (withdrawn) The apparatus of claim 17, further comprising a shim disposed between the first and second bearings for spacing the bearings apart.

24. (withdrawn) A method for preventing rotation of an outer race of a bearing assembly relative to a housing supporting the outer bearing race while still allowing axial movement of the bearing assembly, the method comprising:

- providing a bearing mounted on a rotating shaft disposed within a housing;
- providing a bearing cup adapted to support the outer race therein, the bearing cup having a tang extending axially therefrom;
- preventing the outer race of the bearing from rotating by supporting the bearing cup within the housing such that the tang extends into a portion of the housing; and
- allowing movement of the shaft in an axial direction by allowing the tang to move relative to the portion of the housing.

25. (withdrawn) The method of claim 24, wherein the bearing cup is press fitted onto the outer race of the bearing.

26. (previously presented) A bearing assembly comprising:
- a first inner race;
 - a first outer race;
 - a plurality of first rolling elements disposed between said first inner and outer races;
 - a first bearing cup secured to the outer race and having a portion projecting therefrom for engaging within a recess in a structure in which said bearing assembly is located, to thus prevent said first bearing cup from rotating while allowing the first

bearing cup to move in an axial direction along a longitudinal axis of the bearing assembly; and

a secondary bearing cup having a secondary inner race, a secondary outer race and a plurality of secondary rolling elements disposed between the inner and outer secondary races, the secondary bearing cup being disposed around the secondary outer race and having a plurality of secondary teeth;

wherein the first outer race includes a plurality of slots, the secondary teeth of the secondary bearing cup engaging with the slots so that the first bearing cup prevents rotation of the secondary bearing cup while allowing relative axial movement therebetween; and

a planar biasing spring disposed axially between said first inner and outer races and the second inner and outer races to provide a predetermined axial pre-loading force to the rolling elements.

27. (cancelled)

28. (previously presented) The bearing assembly of claim 26, wherein the slots are larger than the secondary teeth to enable the secondary teeth to rotate therein.

29 (previously presented) The bearing assembly of claim 28, wherein the first bearing cup includes a plurality of teeth spaced apart by slots, the teeth of the first bearing cup engaging between the secondary teeth of the secondary bearing cup to prevent rotation between the first bearing cup and the secondary bearing cup.

30. (previously presented) The bearing assembly of claim 26, wherein each of the secondary bearing cup and the first bearing cup include a radially inwardly extending shoulder.

31. (cancelled)

32. (previously presented) The bearing assembly of claim 26, wherein the first and secondary rolling elements comprise balls.

33. (previously presented) A bearing assembly comprising:

a first inner race;

a first outer race;

a first bearing cup secured to the first outer race, the first bearing cup including a projecting structural element for engaging within a recess of a structure in which said bearing assembly is disposed, and a plurality of teeth;

a first plurality of rolling elements disposed between the first inner and outer races;

a second inner race;

a second outer race;

a second bearing cup secured to the second outer race, the second bearing cup including a plurality of teeth;

a second plurality of rolling elements disposed between the second inner and outer races; and

said projecting structural element preventing rotation of said first bearing cup within said structure while allowing axial movement of said first bearing cup, and said teeth of each of said first and second bearing cups engaging such that said second bearing cup is allowed only a predetermined amount of rotational movement before said second bearing cup is prevented from rotating relative to said first bearing cup.

34. (previously presented) The bearing assembly of claim 33, further comprising a spring disposed axially between said first outer race and said second outer race, for biasing said rolling elements against said first and second inner races, and thus providing a pre-load force to said rolling elements.

35. (previously presented) The bearing assembly of claim 33, wherein said first bearing cup includes a plurality of circumferentially arranged slots around a perimeter portion thereof for engaging with the teeth of said second bearing cup; and

wherein said second bearing cup includes a plurality of circumferentially arranged slots around a perimeter portion thereof for engaging with the teeth of said first bearing cap, while permitting axial movement between said first and second bearing cups.

36. (currently amended) The bearing assembly of claim 33 ^{[[1]]}, wherein said first and second pluralities of rolling elements each comprise balls.